METHOD AND APPARATUS FOR MUD PULSE TELEMETRY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a Divisional Application of Application Serial No. 10/619,197 filed July 14, 2003, entitled "Method and Apparatus for Mud Pulse Telemetry", and now U.S. Patent No. ——————— .

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

BACKGROUND OF THE INVENTION

Field of the Invention

[0003] Embodiments of the invention are directed to mud pulse telemetry in drilling operations. More particularly, embodiments of the invention are directed to data compression techniques for mud pulse telemetry in drilling operations.

Background of the Invention

[0004] In measuring-while-drilling (MWD) and logging-while-drilling (LWD) operations, information regarding the borehole and surrounding formation are gathered during the drilling process. Information gathered may not be needed at the surface immediately, but that information may be required before the tool returns to the surface. For information such as this, U.S. Patent No. 5,774,420 may describe a system whereby stored data (also known as historical data) may be sent from downhole devices to the surface at the request of the surface equipment. Retrieval of the historical information may take place during times when drilling is temporarily paused, such as when the borehole is being conditioned (e.g. by the continuous flow of drilling fluid), or when the tool becomes stuck in the borehole. Transmission of historical information from downhole to the surface may take several hours using known techniques.

[0005] Other information gathered downhole may be needed at the surface as soon as the information is acquired. A limiting factor in sending data from downhole devices to the surface (or for that matter from the surface to downhole devices) is the speed at which the information may be transmitted within the mud column. Where the acquisition rate by the downhole device is greater than the transmission rate, some of the information gathered downhole may not be sent to the surface. In cases such as this, it may be that only every other or every third reading of the "real time" parameter may be sent to the surface.